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Dissociation Among Inhibitory Control Mechanisms in Two Cases With Frontal vs. Non-frontal Damage

Allen C.*, Martin R.[a]

Rice University

Introduction

Although theoretical accounts of inhibition have generally assumed that it is a single construct, data from individual differences (Friedman & Miyake, 2004), neuroimaging (Nee, Jonides, & Berman, 2007; Nee, Wager, & Jonides, 2007), and aging (Allen & Martin, in preparation) have provided evidence of dissociations between different types of inhibitory control mechanisms. For example, there is evidence that response-distractor inhibition, which involves resolving interference from dominant responses or distractors in the external environment, is different from resistance to proactive interference (PI), which involves overcoming interference from previously relevant representations in memory. However, previous work on patients with aphasia has provided little evidence of dissociations between these two inhibition mechanisms (Hamilton & Martin, 2005), though this may be due to the small number of tasks used to assess patient performance. The present study extended previous work by investigating the inhibitory control abilities of two patients with aphasia: patient EV, whose lesion included left frontal regions hypothesized to play a critical role in interference resolution, and patient MB whose lesion was restricted to posterior regions. The first question we addressed was whether more extensive testing would reveal dissociations among tasks tapping the two types of inhibition and the second was whether interference resolution would be related to left frontal (but not posterior) brain lesions, consistent with neuroimaging results.

Method

Two patients and age-matched controls were tested on three response-distractor inhibition tasks (Stroop, nonverbal Stroop, and picture-word interference tasks) and three resistance to PI tasks (recent negatives probe, cued recall-directed forgetting, and release from PI tasks). Inhibitory control abilities were measured by comparing patient interference effects to those of controls.

Results

As shown by the interference effects in Figure 1, frontal patient EV demonstrated consistently exaggerated interference effects across the three response-distractor inhibition tasks, relative to age-matched controls. In contrast, her performance was within the range of controls for two of the three resistance to PI tasks. Patient MB, with a posterior lesion, showed no consistent evidence of exaggerated impairment on any of the inhibitory control tasks.

Discussion

Supporting the notion that inhibition is not a unitary construct, and that at least some aspects of inhibition can be localized to left frontal regions, the left frontal patient EV demonstrated a dissociation between inhibitory control

* Corresponding author.
E-mail address: C.allen@rice.edu .

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mechanisms. These results provide converging evidence for distinct components of inhibitory function.

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